

(21) Application No **8006219**  
(22) Date of filing **25 Feb 1980**  
(30) Priority data  
(31) **21028**  
(32) **16 Mar 1979**  
(33) **Italy (IT)**  
(43) Application published  
**12 Nov 1980**  
(51) **INT CL<sup>3</sup>**  
**F16G 1/28**  
(52) Domestic classification  
**F2Q 2H**  
(56) Documents cited  
**GB 1432620**  
**GB 1404250**  
(58) Field of search  
**F2Q**  
(71) Applicants  
**Industrie Pirelli SpA,**  
**Servizio Brevetti,**  
**Piazzale Cadorna 5,**  
**20123 Milan,**  
**Italy.**  
(72) Inventors  
**Mario Cicognani**  
(74) Agents  
**R E S Waller**

(54) **Toothed transmission belt**

(57) A toothed transmission belt in which the surface of the teeth 3 is covered with a laminate comprising two sheets 6, 7 of a rubberized fabric separated by a layer 8 of an elastomeric material. The elastomeric material forming the "centre" of the laminate is of a different colour from that of the two rubberized fabric layers, so that a visual indication of belt wear is provided.

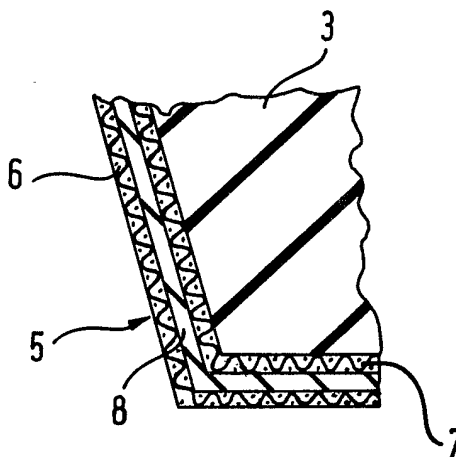


FIG. 2

1/1

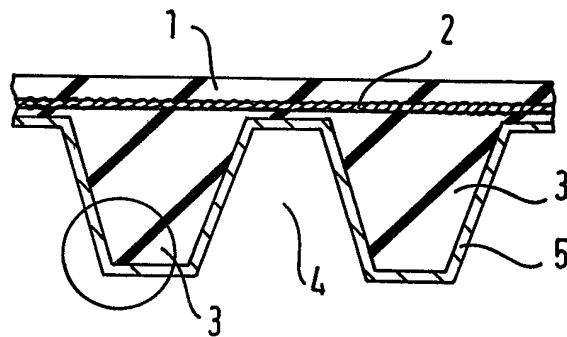


FIG.1

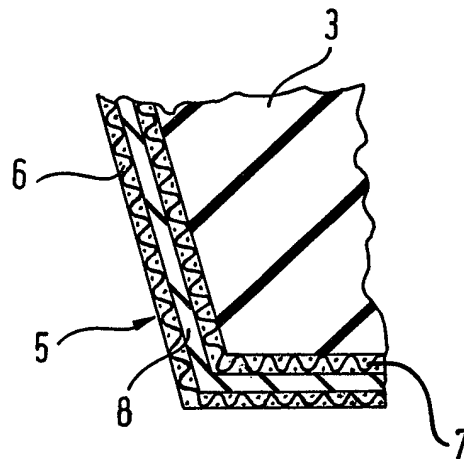


FIG.2

## SPECIFICATION

**Toothed transmission belt**

- 5 The present invention relates to a toothed transmission belt and in particular to a covering for the teeth of such a belt. 5
- As is known, toothed belts are used for transmitting movement between toothed pulleys and the toothed belt/toothed pulley transmission systems are especially suitable to replace the conventional chain-driven systems.
- 10 By comparison with the chain-driven systems, toothed belt/toothed pulley systems are relatively noiseless. However, in the chain-driven systems, wear of the chain leads to an increase of noise in the system which permits substitution of the chain not only before it breaks but also when the chain is in such a condition as to make the system less efficient. 10
- The higher the power which is to be transmitted by such a system, the greater the need for some indication of belt wear. 15
- In a toothed belt/toothed pulley transmission system, which is to transmit high power, it is known from our U.K. Patent No. 1,432,620 to use, as a covering for the teeth, a composite material consisting of two sheets of a rubberized fabric separated by a layer of an elastomeric material. 15
- The said U.K. Patent also discloses that the outermost sheet of rubberized fabric can be a self-lubricating fabric, i.e. a fabric impregnated with an elastomeric material which is able to exude from the fabric in order to compensate for wear of the elastomeric covering of the surface of the teeth. 20
- By means of such toothed belts, it is possible to transmit very high powers and to achieve very high durability.
- Although such toothed belts have a long working life, they are nevertheless subject to wear on the teeth and such wear is inevitable because of the nature of the transmission system. Because of the wear on the teeth, the rubberized fabric covering the teeth also wears. Although this wear is not generally sufficient to cause the belt to break, there is nonetheless an alteration of the mechanical characteristics of the belt with consequent reduction in efficiency of the transmission system. 25
- The present invention aims to avoid such a reduction in efficiency, and to permit the substitution of a toothed belt to be predicted before any appreciable decrease in efficiency occurs. 30
- Accordingly, the present invention provides a toothed transmission belt, the surface of the teeth being covered with a composite material comprising two sheets of a rubberized fabric separated by a layer of an elastomeric material, in which the said layer of elastomeric material is of a different colour from that of the said two rubberized fabric sheets.
- 35 The present invention will be illustrated, merely by way of example, in the following description and with reference to the accompanying drawings. In the drawings: 35
- Figure 1* is a longitudinal section through a portion of a toothed transmission belt according to the present invention;
- Figure 2* is an enlarged view of the "circled" portion of *Figure 1*.
- 40 Referring now to *Figure 1*, a toothed transmission belt comprises a belt body 1 made of an elastomeric material. A plurality of cords 2 is embedded in the belt body, said cords comprising a tension-resistant insert for the belt. The cords 2 must have a high resistance to tension and a low degree of elongation, and may, for example, be made of a metal, of glass fibre, or of a polyamide. 40
- The belt body is provided on one face with a plurality of teeth 3. The teeth are made of an elastomeric material and adjacent teeth define between them spaces 4. The surface of the teeth 3 and of the spaces 4 is covered with a covering layer 5. 45
- Referring now to *Figure 2*, the covering layer 5 comprises two sheets, 6 and 7, of a rubberized fabric, separated by a layer 8 of an elastomeric material.
- Preferably, the rubberized fabric layer 7 consists of a fabric particularly resistant to tear, whilst the rubberized fabric layer 6 is preferably a self-lubricating fabric (as hereinbefore defined). 50
- The elastomeric material forming the belt body 1 and the teeth 3 is a conventional elastomeric material, known *per se* for use in toothed transmission belts, i.e. a compound of a black-coloured elastomeric material.
- The rubberized fabric layer 7 is a fabric impregnated with a compound of elastomeric material of a colour different from black. An example of a suitable compound for impregnating the fabric layer 7 will be described hereinafter. 55
- The layer 8 of elastomeric material which separates the two rubberized fabric layers 6 and 7 is also of a colour different from black.
- The elastomeric material used to impregnate the fabric layer 6 (which covers the outside of the teeth) is an elastomeric material having a black colour and is preferably a material having a low coefficient of friction. 60

On the basis of experimental tests made on a belt according to the present invention, it is preferred to use, for the layer 8, an elastomeric material of white colour made from the following formulation:

5	chloroprene rubber	52% by weight	
	zinc oxide	2.5% by weight	5
	magnesium oxide	2% by weight	
	naphtha oil	1% by weight	
	kaolin	36% by weight	
	sulphur	0.5% by weight	
10	di- <i>ortho</i> -tolyl guanidine	0.5% by weight	10
	stearic acid	0.5% by weight	
	titanium dioxide	5% by weight	

15 The elastomeric material used to impregnate the fabric layer 7, (which is the inner layer of the covering of the belt teeth), can conveniently be the same elastomeric material described in the immediately preceding paragraph. If desired, the fabric layer 7 can be subjected, before impregnation, to a hardening treatment with, for example, a resorcinol/formaldehyde solution. 15

It is to be understood that the present invention includes within its scope the impregnation of the fabric layer 7 with a black coloured elastomeric material, for example the elastomeric material which forms the body and teeth of the belt. In such a case, only the layer 8 of elastomeric material, i.e. the layer between the two rubberized fabric layers 6 and 7, has a colour which is different from that of the other parts of the belt. 20

When a toothed belt according to the present invention is used in a toothed belt/toothed pulley transmission system, meshing occurs between the teeth of the belt and those of the pulleys and the belt teeth slide relative to the pulley teeth.

25 During this sliding the toothed surface of the belt wears and such wear is particularly noticeable on the teeth themselves. 25

The wear of the teeth occurs on the rubberized fabric layer 6 (which is the outer layer of the covering of the teeth).

Even when the rubberized fabric layer 6 is a fabric of the self-lubricating type, it will begin to wear once the impregnating elastomeric material is exhausted. 30

Up to the time at which the fabric layer 6 begins to wear, the belt retains all the efficient mechanical characteristics that it had when new.

Wear of the fabric layer 6, however, affects the mechanical characteristics of the belt by reducing the mechanical resistance of the teeth and consequently reducing the transmitted power.

35 The presence of the layer 8 of elastomeric material, said layer having a colour different from that used to impregnate the fabric layer 6, provides that when the fabric layer 6 begins to wear the colour of the layer 8 appears on the surface of the teeth and gives a visual indication that the belt must be replaced. 35

The present invention also includes within its scope the embodiment in which a non-woven fabric impregnated with an elastomeric material is used in place of one of the two rubberized fabric layers. In particular the present invention also includes the embodiment in which a non-woven fabric impregnated with a compound of elastomeric material of a colour corresponding to that of the layer 8 (as described herein), is used in place of the rubberized fabric which is to be innermost with respect to the surface of the teeth. 40

## 45 CLAIMS 45

1. A toothed transmission belt, the surface of the teeth being covered with a composite material comprising two sheets of a rubberized fabric separated by a layer of an elastomeric material, in which the said layer of elastomeric material is of a different colour from that of the said two rubberized fabric sheets.

50 2. A transmission belt according to Claim 1, in which the rubberized fabric sheet immediately adjacent the teeth has the same colour as the layer of elastomeric material which separates the said two sheets of rubberized fabric. 50

3. A transmission belt according to Claim 1 or 2, in which the elastomeric material which comprises the layer separating the said two sheets of rubberized fabric is made from the following formulation:

55	chloroprene rubber	52% by weight	55
	zinc oxide	2.5% by weight	
	magnesium oxide	2% by weight	
	naphtha oil	1% by weight	
60	kaolin	36% by weight	60
	sulphur	0.5% by weight	
	di- <i>ortho</i> -tolyl-guanidine	0.5% by weight	
	stearic acid	0.5% by weight	
	titanium dioxide	5% by weight	

---

4. A toothed transmission belt, substantially as hereinbefore described, with reference to and as illustrated in the accompanying drawings.

---

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon Surrey, 1980.  
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.